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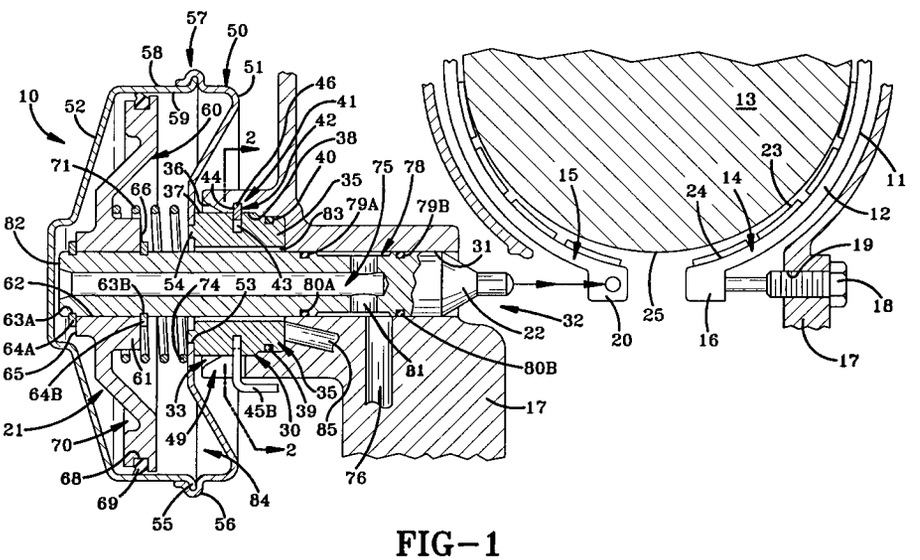
(54) Servo mechanism for a vehicular transmission.

(57) A servo mechanism (21) adapted to control a brake assembly (11) used in conjunction with a vehicular transmission comprises a self-contained envelope (10) which is adapted to be demountably received within a receptacle (30) provided in the transmission case (17). A pilot bore (31) penetrates the transmission case and is located axially of the receptacle. The envelope incorporates a base portion (51), a cap portion (52) and a coupler portion (35). A servo-apply pin (22) extends outwardly through the coupler portion of the envelope to be reciprocatingly received within the pilot bore. A piston chamber (70) is provided interiorly of the base and cap portions. An actuating piston (60) is operatively received in the piston chamber, and means (75,78,81) are included to effect communication of hydraulic pressure from a conduit (76) within the transmission case, through the coupler portion of the envelope and the servo-apply pin into the piston chamber. Locking means (42) are also provided selectively to secure the envelope to the transmission case.



FIG−1

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The present invention relates to an improved servo mechanism for actuating a torque transfer device in the nature of a brake band of the type generally associated with the control of planetary gear sets in a transmission. Specifically, the present invention relates to a self-contained envelope which forms a housing for the servo mechanism, the self-contained envelope permitting more convenient and economical assembly and/or replacement of the servo assembly.

Automatic transmissions may employ single or multiple planetary gear sets.

Brake bands are used to selectively retard, stop and/or preclude the rotation of one or more of the rotatable planetary gear members in the transmission. A servo mechanism employed to operate each brake band generally incorporates a hydraulically operated piston assembly. Historically, the manufacture of the transmission case within which the planetary gear set was to be housed was further complicated because the transmission case required a boss, the interior of which was accurately machined to receive the servo mechanism. For example, the boss was machined to provide the necessary piston chamber within which an actuating piston assembly could reciprocate to effect axial translation of a servo-apply pin, and thereby operate the brake band assembly.

Transmission cases have rather universally been, and continue to be, metallic castings. Castings do, on occasion, incorporate voids, but even microscopic voids, which are generally considered as merely contributing to the porosity of the casting, can require additional labour to prevent leakage paths through the casing.

As should be readily apparent, the structural properties of strength and hardness required to make an acceptable transmission case are not necessarily conducive to providing a readily machinable casting. In fact, variations in the sectional thickness of a casting, and particularly a casting having the complexity of a transmission case, can cause localized hard or soft spots. Although one might ideally desire a more homogenous casting, such localized variations in the physical properties of the casting may not themselves negate the suitability of the casting to serve as a transmission case. Unfortunately, however, such localized variations can adversely affect the ability of the casting to be acceptably machined.

For example, the reaction of a machine tool against a localized hard spot can cause microscopic, if not macroscopic, grooves which could well preclude the effective sealing of the pressure chamber required for the piston assembly in a servo mechanism built into the transmission case, and such flaws might not be identified until after at least partial assembly of the transmission. But even if any such flaws were detected at the earliest possible opportunity, the result could well be a rejected transmission case.

Hydraulically operated servo mechanisms for vehicular transmissions can be complex and relatively expensive to manufacture -- particularly according to prior art methods whereby the servo mechanisms had to be linearly assembled within a cavity machined into a boss on the transmission case. Such historic assembly techniques are labour intensive and unduly contribute to the cost of the transmission.

It is, therefore, a primary object of the present invention to provide a servo mechanism that will permit a significant reduction in the complexity of the transmission case with which the servo mechanism is to be employed.

To this end, a servo mechanism, in accordance with the present invention, comprises a self-contained envelope comprising a base portion, a cap portion and a coupler portion; a servo-apply pin extending outwardly through the coupler portion of the self-contained envelope to be reciprocatingly receivable within a pilot bore in the transmission case; a piston chamber defined by the interior of the base and cap portions; an actuating piston operatively received in the piston chamber, the actuating piston being secured to the servo-apply pin; means to effect communication of hydraulic pressure from a conduit within the transmission case, through the coupler portion and the servo-apply pin into the piston chamber; and locking means selectively to secure the self-contained envelope to the transmission case.

The present invention provides a servo mechanism, as above, that will permit a reduction in the machining operations required to prepare a transmission case for having the improved servo mechanism operatively secured thereto and thereby reduce the scrap rate for cast transmission cases and concomitantly reduce the cycle time for the production of such transmission cases.

The present invention also provides a servo mechanism, as above, that is self-contained in a novel and unique envelope.

The present invention further provides a servo mechanism that can be demountably secured to a transmission case as a unit in order to facilitate assembly and/or replacement of the servo mechanism, if necessary or desirable.

In general, a servo mechanism embodying the concepts of the present invention fits into a receptacle in the transmission case. The receptacle includes a pilot bore and a coupling chamber that are axially aligned. The servo-apply pin extending outwardly from the self-contained envelope is received within the pilot bore for axial reciprocation.

The servo-apply pin is connected to the actuating piston that is operatively received within the self-contained envelope. The piston chamber provided within the self-contained envelope is operatively associated with the piston. Hydraulic fluid -- delivered by the passage means which are included within the servo mechanism, and which communicate with a supply/discharge conduit within the transmission case through the interaction between the coupler portion of the envelope and the coupling chamber in the receptacle -- effects selective pressurization and de-pressurization of the piston chamber.

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a cross-sectional view through a portion of a typical vehicular transmission depicting a servo mechanism housed within a self-contained envelope and embodying the concepts of the present invention;

Figure 2 is end view taken substantially along line 2--2 of Figure 1 of the snap ring;

Figure 3 is a side elevation, taken substantially along line 3--3 of Figure 2 of the snap ring;

Figure 4 is a cross-sectional view similar to Figure 1 and depicting a variation in the construction of the self-contained envelope depicted in Figure 1; and

Figure 5 is a cross-sectional view similar to Figure 1 but depicting a further alternative embodiment for the configuration of the self-contained envelope as well as the locking arrangement.

One representative form of a self-contained envelope, in which a servo mechanism may be housed which embodies the concepts of the present invention, is designated generally by the numeral 10 in Figure 1. The representative self-contained envelope 10 is depicted in the environment of a vehicular transmission, and in particular, a transmission incorporating at least one planetary gear set. A brake band assembly 11 having a backing strap 12 circumscribing a rotatable drum member 13 that may be presented from a ring gear, a carrier or even a sun gear in a planetary gear system, as is well known to the art, so that the details of a typical planetary gear system need not be depicted, or described, herein. Such planetary gear systems are described in US Patent No. 2,856,794, or US Patent No. 4,223,569, incorporated herein by reference.

As depicted in Figure 1, the backing strap 12 incorporated in the representative brake band assembly 11 has first and second end portions 14 and 15. An anchor subassembly 16 may be connected to the first end portion 14 of the backing strap 12. The anchor subassembly 16 is, in turn, secured to the transmission case or housing 17, as by an adjustable set screw 18 which extends through a threaded aperture 19 in the transmission case 17 (the full remainder of which is not shown).

An input connector 20 may be connected to the second end portion 15 of the backing strap 12, and a servo-apply pin 22, which constitutes a portion of the servo mechanism 21 and which is presented from the self-contained envelope 10, interacts with the input connector 20 by means heretofore well known in the art. A friction lining 23, which is often a resin-coated paper pad, is secured, as by an epoxy, to that surface 24 of the backing strap 12 that is disposed in opposition to the cylindrical outer surface 25 of the rotatable drum member 13.

The rotatable drum member 13 is, of course, affixed to one of the rotatable components in a planetary gear set so as to rotate therewith. The frictional braking action applied by the brake band assembly 11 is controlled by actuation of the servo pin 22 which receives input from a hydraulic or mechanical source in a well known manner. The application of the hydraulic force may, according to the concepts of the present invention, be applied within the self-contained envelope 10, as will be hereinafter more fully described.

Extension of the servo-apply pin 22 forces it against, and displaces the input connector 20 secured to the second end portion 15 of the backing strap 12. Displacement of the input connector 20 in response to extension of the servo-apply pin 22 tends, because the anchor subassembly 16 presented from the first end portion 14 of the backing strap 12 is secured to the transmission case 17, to constrict the diameter of the backing strap 12 about the outer surface 25 on the rotatable drum member 13 to impart a frictional engaging force therebetween. Conversely, retraction of the servo-apply pin 22 allows the backing strap 12 to expand relative to the outer surface 25 on the rotatable drum member 13, thereby releasing the frictional engaging force between the backing strap 12 and the drum member 13.

The self-contained envelope 10, as may be seen in Figure 1, is demountably secured in a receptacle 30 that is formed with the transmission case 17 and which need only be machined to a modest extent to receive the self-contained envelope 10. Receptacle 30 includes a pilot bore 31 that is located axially of the receptacle 30. The pilot bore 31 penetrates the transmission case 17 such that one end of the pilot bore 31 opens into a plenum cavity 32 located interiorly of the transmission case 17. The other end of the pilot bore 31 opens into a coupling chamber 33. The pilot bore 31, the coupling chamber 33 -- and the hereinafter described structure thereof -- constitute the recep-

tacle 30. As will be hereinafter more fully described, a portion of the self-contained envelope 10, and the servo-apply pin 22 extending outwardly from the self-contained envelope 10, cooperatively interact with the receptacle 30.

A cylindrical coupler portion 35 of the self-contained envelope 10 is insertably receivable within the coupling chamber 33, and as depicted, the mouth portion 36 of the coupling chamber 33 may be flared axially outwardly to facilitate insertion of the coupler portion 35. Once the coupler portion 35 of this embodiment has been insertably received within the coupling chamber 33, the exterior surface 37 of the coupler portion 35 is preferably disposed in contiguous juxtaposition with the interior surface 38 of the coupling chamber 33. In fact, the mating surfaces 37 and 38 may be stepped, as shown and if desired, which contributes even further to a more facile insertion of the coupler portion 35 into the coupling chamber 33 during assembly.

In any event, the coupler portion 35 is sealed within the coupling chamber 33, as by an O-ring 39 that is received within an annular groove 40 in the exterior surface 37 of the coupler portion 35 to engage the interior surface 38 of the coupling chamber 33. In this embodiment the interior surface 38 is preferably machined to accept the coupler portion 35 and permit the hermetical seal that is accomplished by the O-ring 39.

A locking mechanism 41 is cooperatively interactive between the coupler portion 35 and the receptacle 30 releasable to secure the coupler portion 35 within the coupling chamber 33. As is best seen in Figures 1 and 2, a snap ring 42 may be mounted within a retention groove 43 that is recessed into the exterior surface 37 of the coupler portion 35. When the coupler portion 35 is seated within the coupling chamber 33, a locking groove 44 recessed into the interior surface 38 of the coupling chamber 33 is disposed in opposition to the retention groove 43 in the coupler portion 35 so that it may be lockingly engaged by the snap ring 42.

The interior diameter of the retention groove 43 is selected in relation to the inner diameter of a body portion 46 of the snap ring 42, such that when the snap ring is constricted -- as when one compresses end tabs 45A and 45B -- the body portion 46 of the snap ring 42 may be diametrically constricted so as to be received within the retention groove 43 to a sufficient extent that the coupler portion 35 may be readily inserted into the coupling chamber 33. When the coupler portion 35 has thus been fully inserted into the coupling chamber 33, one may release the constricting pressure applied to the end tabs 45 and the body portion 46 of the snap ring will expand to engage not only the retention groove 43 but also the locking groove 44, thus locking the coupler portion 35 within the coupler chamber 33 of the receptacle 30.

As seen from a comparison of Figures 1 to 3, the end tabs 45A and 45B are disposed radially outwardly from the body portion 46 of the snap ring 42 by extension arms 48A and 48B, respectively. The extension arms 48 are received within an axially disposed, preferably tapered, slot 49 provided in the transmission case 17 and extend radially outwardly from the mouth portion 36 not only to provide manual access to the end tabs 45 but also to allow the coupler portion 35 to be insertably received within the coupling chamber 33 with minimal interference.

In the exemplary embodiment of the self-contained envelope 10 depicted in Figure 1, a housing 50 thereof is depicted as being comprised of a base portion 51, a cap portion 52 and the heretofore described coupler portion 35. The base portion 51 is provided with a central aperture 53 that frictionally engages the outer periphery of a mounting boss 54 which extends axially from the coupler portion 35. The connection therebetween may be enhanced by staking the boss 54 to that portion of the base 51 which defines the central aperture 53.

The cap portion 52 of the housing 50 may be provided with a radially extending rim 55 that extends circumferentially of the cap portion 52 and is mechanically engaged by the folded edge 56 of the base portion 51 in a typical sheet metal seam 57. The joinder of the base portion 51 to the coupler portion 35, as well as the joinder of the cap portion 52 to the base portion 51, both provide a hermetical seal to preclude uncontrolled communication between the interior of the housing 50 and the exterior environment to which the self-contained envelope 10 may be exposed.

A circumferential outer wall 58 of the cap portion 52 defines an interior cylinder 59 within which an actuating piston 60 reciprocates. The piston 60 has a central hub portion 61 that is penetrated by an axial bore 62 within which the servo-apply pin 22 is received. A pair of axially spaced annular grooves 63A and 63B are provided on the servo-apply pin 22 in order to receive retaining rings 64A and 64B, respectively. Retaining ring 64A engages a first end wall 65 on the hub portion 61, and retaining ring 64B engages a second end wall 66 on the hub portion 61. With the hub portion 61 of the actuating piston 60 thus embraced between the retaining rings 64, the piston 60 is anchored in axially fixed relation with respect to the servo-apply pin 22 so that as the actuating piston 60 is moved axially within the cylinder 59 the servo-apply pin 22 translates axially with the piston 60.

The radially outer periphery of the piston 60 may be provided with a circumferential recess 68 within which an annular wiping seal 69 is received.

The wiping seal 69 is thus interposed between the actuating piston 60 and the cylinder 59 to maintain the integrity of piston chamber 70 as the piston 60 reciprocates within the cylinder 59.

A compression spring 71 is preferably interposed between the actuating piston 60 and the base portion 51 of the housing 50. Specifically, a portion the spring 71 may circumscribe the hub portion 61 of the piston 60. By thus circumscribing the hub portion 61, the spring 71 tends to remain disposed concentrically of the servo-apply pin 22. With the spring 71 so disposed, end 74 of the spring 71 engages the base portion 51 of the housing 50 in proximity to the connection of the base portion 51 to the coupler portion 35 in order to bias the piston 60 and thereby retract the servo-apply pin 22.

A passage 75, which opens into the piston chamber 70 through end 82 of the servo-apply pin 22, extends axially within the servo-apply pin 22 to assist in effecting communication between the piston chamber 70 and a conduit 76 which provides or drains the pressurized fluid to operate the servo mechanism 21 contained within the self-contained envelope 10. As is also best seen from Figure 1, the conduit 76 opens into the pilot bore 31. A manifold recess 78 is provided on the outer surface of the servo-apply pin 22, and a transverse or cross bore 81 effects communication between the manifold recess 78 and the axial passage 75. When appropriately positioned, the manifold recess 78 will maintain uninterrupted communication between the piston chamber 70 and the conduit 76 irrespective of whether the servo-apply pin 22 has been retracted by the action of the compression spring 71 or has been protracted by action of the piston 60.

In order to seal the manifold recess 78, a pair of annular grooves 79A and 79B are spaced axially beyond the opposite ends of the manifold recess 78 to receive O-rings 80A and 80B, respectively. Hence, the presence of pressurized fluid within the conduit 76 is communicated into the piston chamber 70 to effect protraction of the servo-apply pin 22, and thereby actuate the brake band assembly 11 in a manner well known to the art when the force applied by the pressurized fluid within the piston chamber 70 exceeds the force applied by the compression spring 71 to retract the servo-apply pin 22.

Conversely, when the fluid pressure within conduit 76 is reduced to the point that the force applied by spring 71 exceeds the force applied by the fluid pressure within piston chamber 70 against the piston 60, the piston chamber 70 may drain into and through the conduit 76 allowing the spring 71 to move the piston 60 to retract the servo-apply pin 22.

It should also be noted that bore 83, through the coupler portion 35 to receive the servo-apply pin 22, need not be sealed. In that way any fluid which might gain entrance to the cavity 84 in the housing 50 between piston 60 and base portion 51 may be continuously evacuated through a relief drain 85 into the plenum cavity 32 within the transmission case 17.

As should now be apparent, a fully operative servo mechanism 21 can be housed within the self-contained envelope 10 for facile assembly, removal and replacement, and at a minimal cost.

It should also be noted that the self-contained envelope may be fabricated from a heavier metal that can be more readily welded than joined by sheet metal seams. An example of such a variation is depicted in Figure 4, wherein a housing 150 of a self-contained envelope 110 comprises base and cap portions 151 and 152 of relatively heavy metal. As such, the base portion 151 can be welded to coupler portion 135, as at 137, and the cap portion 152 can, in turn, be welded to the base portion 151, as at 147. With a welded construction it would also be convenient to eliminate the hub portion of piston 160. In that way web portion 173 can be welded, or press fit, as shown, directly to servo-apply pin 122.

Figure 4 also depicts an alternative arrangement that will insure that any fluid within cavity 184 of housing 150 can escape between the servo-apply pin 122 and bore 183 through the coupler portion 135. Specifically, an axially oriented recess 186 may be provided in the exterior surface of the servo-apply pin 122, at least for a length sufficient to provide communication therealong, irrespective of whether the servo-apply pin 122 has been retracted or protracted. The remaining structural configuration of this embodiment is virtually identical with the embodiment shown and described in conjunction with self-contained envelope 10 and need not, therefore, be repeated.

A further variation, by way of an alternative embodiment, is depicted in Figure 5. In this embodiment a coupler portion 235 has been formed as an integral part of self-contained envelope 210. Accordingly, the self-contained envelope 210 may be demountably secured in a receptacle 230 that is formed with the transmission case 217 of a vehicular transmission and need also only be machined to a modest extent. The receptacle 230 includes a pilot bore 231 that is located axially of the receptacle 230. The pilot bore 231 penetrates the transmission case 217 such that one end of the pilot bore 231 opens into plenum cavity 232 located interiorly of the transmission case 217. The other end of the pilot bore 231 opens into the coupling chamber 233. In this embodiment as well, the pilot bore 231 and the coupling chamber 233, including

any structure thereof, constitute the receptacle 230, but in this embodiment, the coupling chamber 233 requires even less machining than receptacle 30 to accommodate the self-contained envelope 210.

Turning now to a description of the self-contained envelope 210, housing 250 thereof is comprised of a base portion 251, a cap portion 252 and the coupler portion 235. However, in this embodiment, the base portion 251 and the coupler portion 235 may be unitary. The base portion 251 also includes an inclined section 286 which extends axially and radially outwardly from the coupler portion 235 and which terminates in a preferably annular rim section 287. If desired, a plurality of reinforcing ribs 288 may be included in the inclined section 286 to lend stability to the base portion 251 and also to provide a discontinuous planar reaction surface 289 against which end 274 of compression spring 271 can be seated, as will be hereinafter more fully described.

Radially outer wall 258 of cap portion 252 terminates in a radially extending rim 255 that circumscribes the cap portion 252 and is mechanically engaged by the folded edge 256 presented from the radially outer wall 287 of the base portion 251 in a typical sheet metal seam 257. Here, too, the joinder of the cap portion 251 to the base portion 252 provides a hermetical seal to preclude uncontrolled communication between the interior of the housing 250 and the exterior environment to which the self-contained envelope 210 may be exposed.

The interior of the circumferential outer wall 258 of the cap portion 252 defines a cylinder 259 within which an actuating piston 260 reciprocates. The piston 260 has a central hub portion 261 that is penetrated by an axial bore 262 within which the servo-apply pin 222 is received. A pair of axially spaced annular grooves 263A and 263B are provided on the servo-apply pin 222 in order to receive retaining rings 264A and 264B, respectively. Here, too, the retaining ring 264A engages first end wall 265 on the hub portion 261, and retaining ring 264B engages second end wall 266 on the hub portion 261. With the hub portion 261 of the actuating piston 260 thus embraced between the retaining rings 264A and 264B, the piston 260 and servo-apply pin 222 are anchored in axially fixed relation with respect to each other so that as the actuating piston 260 is moved axially within the cylinder 259 the servo-apply pin 222 translates axially with the piston 260.

The radially outer periphery of the piston 260 may be provided with a circumferential recess 268 within which an annular wiping seal 269 is received. The wiping seal 269 is thus interposed between the actuating piston 260 and the cylinder 259 to maintain the integrity of the piston chamber 270 as the piston 260 reciprocates within the cylinder 259.

Compression spring 271 is preferably interposed between the actuating piston 260 and the base portion 251 of the envelope housing 250. Specifically, one end portion of the spring 271 may circumscribe the hub portion 261 of the piston 260. By thus circumscribing the hub portion 261, the spring 271 tends to remain disposed concentrically of the servo-apply pin 222. With the spring 271 thus disposed with respect to the cap portion 251, end 274 of the spring 271 engages the reaction surface 289 presented from the reinforcing ribs 288 incorporated in the inclined section 286 of the base portion 251 in order to bias the piston 260 and thereby retract the servo-apply pin 222.

A passage 275 extends axially within the servo-apply pin 222 and communicates with a cross bore 281 to assist in effecting communication between the piston chamber 270 and conduit 276 which provides or drains the pressurized fluid to operate the servo mechanism 221 contained within the self-contained envelope 210. The conduit 276 opens into the pilot bore 231 through an annular recess 277 in the wall of the pilot bore 231. An annular manifold recess 278 is provided on the surface of the servo-apply pin 222. The manifold recess 278 remains in constant communication with the first recess 277 by virtue of a bore 290 which penetrates the coupler portion 235 of the self-contained envelope 210 in order to permit hydraulic fluid to flow freely between the passage 275 and the conduit 276 irrespective of whether the servo-apply pin 222 has been retracted by the action of the compression spring 271 or has been protracted by action of the piston 260.

In order to seal the manifold recess 278 a pair of annular grooves 279A and 279B -- which are spaced axially beyond the opposite ends of the manifold recess 278 -- are recessed into the outer surface of the servo-apply pin 222 to receive O-rings 280A and 280B, respectively. In order to seal the first recess 277 a pair of annular grooves 291A and 291B -- which are spaced axially beyond the opposite sides of the first recess 277 -- are recessed into the surface of the pilot bore 231 to receive O-rings 292A and 292B, respectively. The coupler portion 235 of the self-contained envelope 210 is disposed radially between the servo-apply pin 222 and the pilot bore 231.

A locking means 241 is employed selectively to secure the self-contained envelope 210 to the transmission case 217. As depicted in Figure 5, the transmission case 217 is provided with a shoulder 293 upon which the seam 257 between the base portion 251 and the cap portion 252 may be supported. A compression member 294 may be interposed between the seam 257 and the shoulder 293

to apply a resilient, axial force outwardly against the seam 257. The compression member 294 also acts as a flexible joint between the transmission case 217 and the self-contained envelope 210 in order to dampen any shock or vibration therebetween.

The actual retention of self-contained envelope 210 on the transmission case 217 may be accomplished by a split retaining ring 295. The split retaining ring 295 is received in a locking recess 296 machined into the interior surface 238 of the coupling chamber 233. When the split retaining ring 295 is insertably received within the locking recess 296, it precludes axial movement of the self-contained envelope 210, thus locking it in place.

As should now be apparent, the present invention provides a new and novel concept of housing a servo mechanism for a vehicular transmission in a self-contained envelope that not only provides a simplified assembly process by supplying a single unit for insertion into a receptacle in the transmission case but also accomplishes the other objects of the present invention.

The disclosure in United States patent application No 844,081, from which this application claims priority, and in the abstract accompanying this application are incorporated herein by reference.

Claims

1. A servo mechanism (21) mountable in a transmission case (17) for actuating a brake band assembly (11) in a transmission, the servo mechanism comprising a self-contained envelope (10) comprising a base portion (51), a cap portion (52) and a coupler portion (35); a servo-apply pin (22) extending outwardly through the coupler portion of the self-contained envelope to be reciprocatingly receivable within a pilot bore (31) in the transmission case; a piston chamber (70) defined by the interior of the base and cap portions; an actuating piston (60) operatively received in the piston chamber, the actuating piston being secured to the servo-apply pin; means (75,78,81) to effect communication of hydraulic pressure from a conduit (76) within the transmission case, through the coupler portion and the servo-apply pin into the piston chamber; and locking means (42) selectively to secure the self-contained envelope to the transmission case.

2. A servo mechanism as claimed in Claim 1, wherein the locking means comprises a locking ring (42) receivable in a retention groove (43) in the coupler portion (35) and capable of diametral constriction and expansion from a normal diameter; and means (45) selectively to constrict the locking ring within the retention groove to a diameter such that it will permit unimpeded insertion of the coupler portion into a coupling chamber (33) located axially of the pilot bore (31) in the transmission case (17), the normal diameter of the locking ring being such that the locking ring may be simultaneously received in both the retention groove and a locking groove (44) in the coupling chamber.

3. A servo mechanism as claimed in Claim 2, wherein the locking ring (42) has a body portion (46) and end tabs (45); the body portion being an annularly discontinuous spring which tends to expand when diametrically constricted; the end tabs providing the means by which to constrict the body portion against the spring action thereof.

4. A servo mechanism as claimed in Claim 3, wherein extension arms (48) connecting the body portion (46) to the end tabs (45) to facilitate access to, and manual manipulation of, the end tabs; the extension arms being receivable in an axial slot (49) in the transmission case (17).

5. A servo mechanism as claimed in Claim 1, wherein the cap and base portions (252,251) of the self-contained envelope (210) are secured together by means of a circumferentially extending, radially protruding seam (257); and wherein the locking means (295) is interactive between the seam and the transmission case (217).

6. A servo mechanism as claimed in Claim 5, wherein the locking means comprises a retaining ring (295) which is removably received within a locking slot (296) in the transmission case (217) to retain the seam (257) between the retaining ring and a shoulder (293) axially spaced from the locking slot.

7. A servo mechanism as claimed in any one of Claims 1 to 4, wherein the base and cap portion (51,52) of the self-contained envelope (10) are secured together by means of a circumferentially extending, radially protruding seam (57).

8. A servo mechanism as claimed in Claim 7, wherein the base portion (251) and coupler portion (235) are formed integrally in one piece.

9. A servo mechanism as claimed in any one of Claims 1 to 4, wherein the base portion (151), cap portion (152) and coupler portion (135) are welded together to form the self-contained envelope (110).

10. A servo mechanism as claimed in any one of Claims 1 to 9, wherein the means to communicate between the conduit (76) and the piston chamber (70) comprises a passage (75) extending axially of the servo-apply pin (22) and opening into the piston chamber; and a cross bore (81) in the servo-apply pin communicating with the passage and an annular manifold (78) recessed into the exterior of the servo-apply pin.

11. A servo mechanism as claimed in Claim 10, in which the coupler portion (235) extends along the exterior of the servo-apply pin (222), wherein the means to communicate between the conduit (276) and the piston chamber (270) further comprises a bore (290) penetrating the coupler portion adjacent the annular manifold (278).

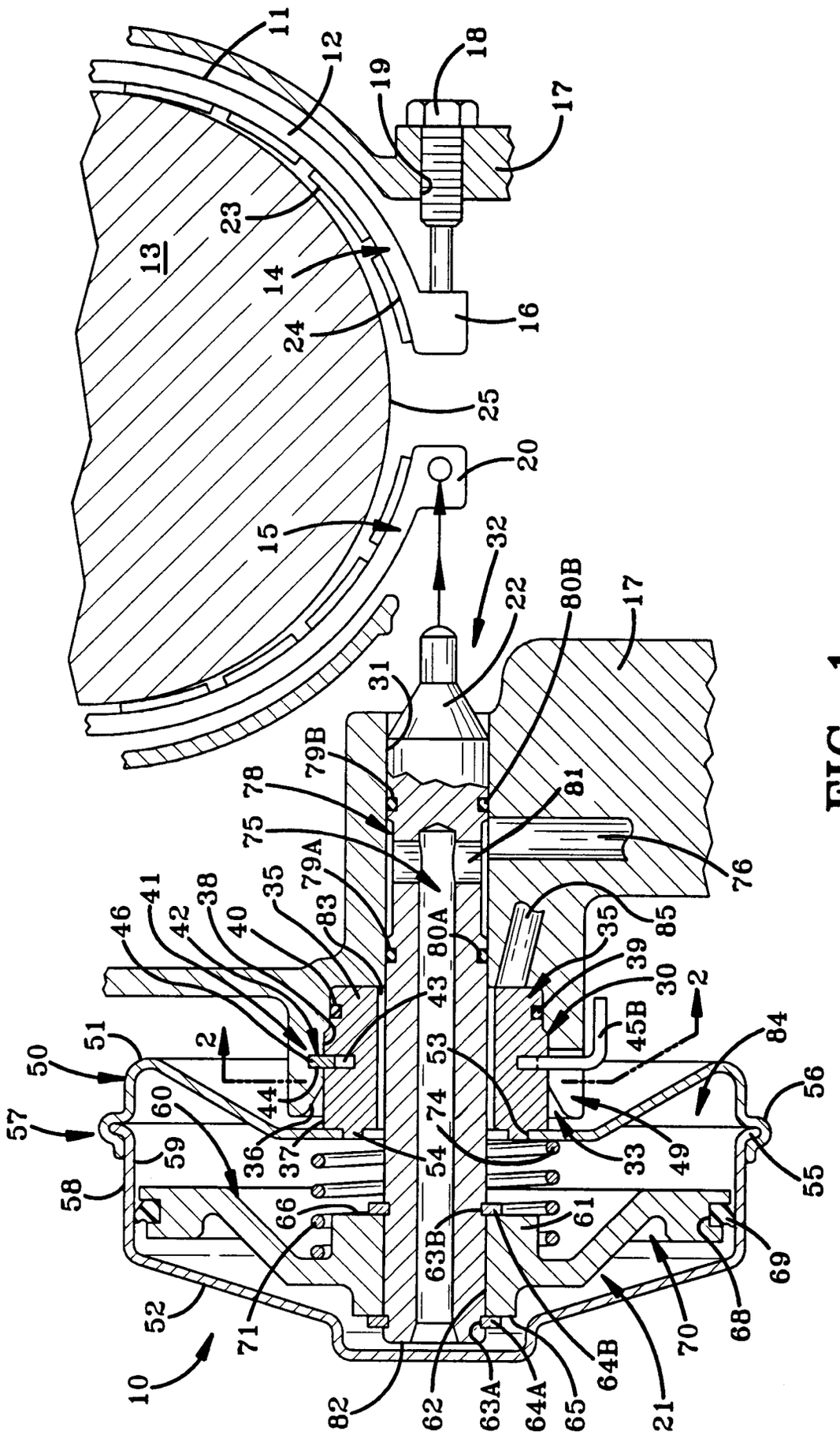
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FIG-1

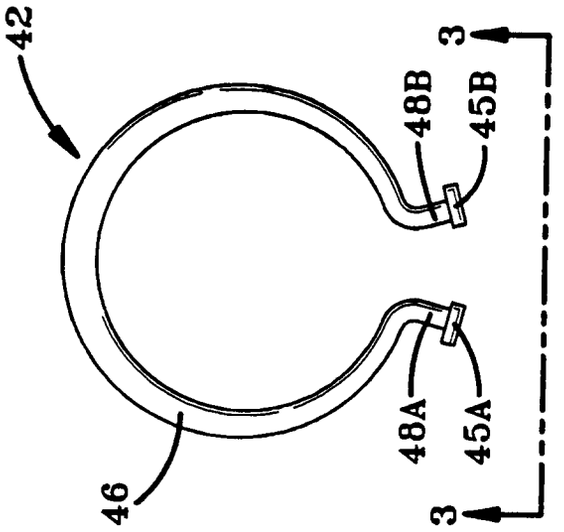


FIG-2

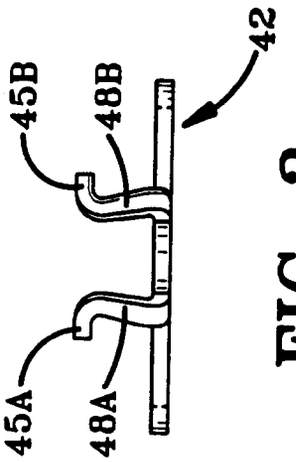


FIG-3

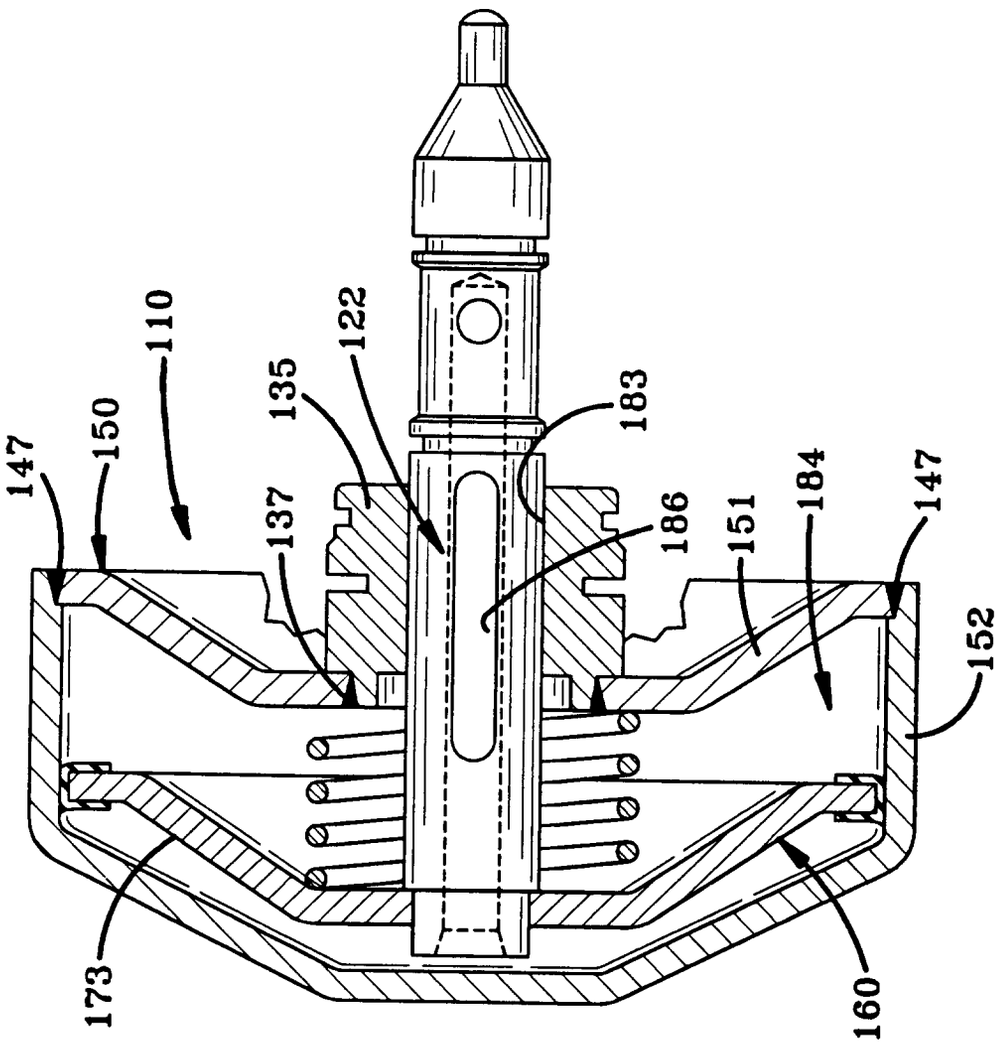
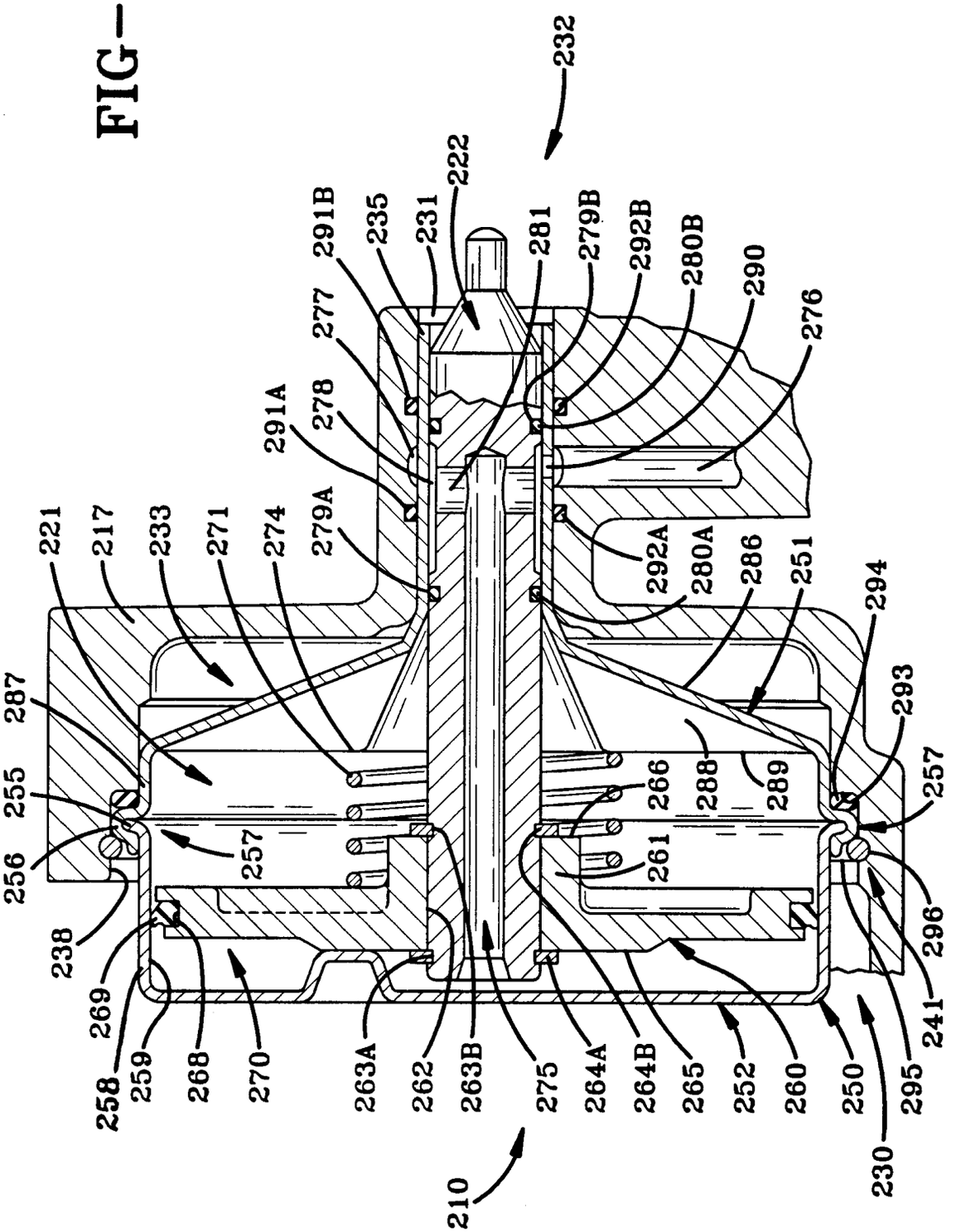


FIG-4

FIG-5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291B
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291A
279A
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279B
292B
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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0336

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 349 111 (GENERAL MOTORS CORPORATION) * figures 1-4 * * column 3, line 19 - column 14, line 31 *	1	F16H63/30 F16H61/00
A	DE-A-1 576 093 (GENERAL MOTORS CORPORATION) * the whole document *	1,5,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F16H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 JUNE 1993	VAN PROOIJEN T.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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